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A new species and a new record in *Begonia* sect. *Platycentrum* (Begoniaceae) from Thailand

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ABSTRACT. *Begonia khaophanomensis* Phutthai & M.Hughes is described from a collection made on granitic rock in Krabi Province in Peninsular Thailand. It is endemic to the type locality of Khao Phanom Bencha National Park, and is assessed as Least Concern using the IUCN criteria. *Begonia macrotoma* Irmsch. is noted as a new record for Thailand from collections in Chiangmai, Nakhon Ratchasima and Nakhon Nayok provinces; the species is also found in China, Myanmar, NE India, Nepal and Vietnam. Both species belong to *Begonia* sect. *Platycentrum*. A key to the species of *Begonia* sect. *Platycentrum* in Thailand is provided.

Keywords. *Begonia khaophanomensis*, *Begonia macrotoma*, China, Myanmar, NE India, Nepal, Peninsular Thailand, Vietnam

Introduction

The genus *Begonia* L. is one of the largest angiosperm genera, comprising around 1803 species (Hughes et al., 2015). Thailand has 54 accepted species of *Begonia*, which are found in habitats from near sea level to high mountain summits, with nearly half of them occurring on karst limestone (Hughes, 2008; Phutthai et al., 2009, 2012, 2014).

Begonia sect. *Platycentrum* (Klotzsch) A.DC. comprises 126 species (Hughes et al., 2015) and is widely distributed in Asia, ranging from India to the Himalayas, Indo-China, China, Taiwan, and Malesia (Doorenbos et al., 1998; Shui et al., 2002; Ding et al., 2014). In Thailand, six species are reported in the section to date: *Begonia cathcartii* Hook.f., *B. hatacoa* Buch.-Ham. ex D.Don, *B. palmata* D.Don, *B. siamensis* Gagnep, *B. smithiae* Geddes and *B. venusta* King. They are all confined to montane forests above 1000 m in altitude (Hughes, 2008; Phutthai et al., 2009). However, based on molecular data (Thomas et al., 2011), the placement of *Begonia smithiae* in *Begonia* sect. *Platycentrum* appears to be erroneous and is a phylogenetically rather isolated species closer to *Begonia* sect. *Parvibegonia* A.DC. (Doorenbos et al., 1998).

A new species and a new record in *Begonia* sect. *Platycentrum* are presented here. They are characteristic of the section in having rhizomatous stems, 2-locular ovaries with branched placentas, and anthers with extended connectives. *Begonia khaophanomensis* Phutthai & M.Hughes is a rare and narrowly endemic species which is known only from the type locality in Krabi Province. It grows in granitic rock crevices at altitudes around 1200 m in Khao Phanom Bencha National Park. We also report *Begonia macrotoma* Irmsch. as a new record for the flora of Thailand from Chiangmai, Nakhon Ratchasima and Nakhon Nayok provinces. Terminology in the descriptions follows Beentje (2010).

Key to the species of *Begonia* sect. *Platycentrum* in Thailand

1a. Leaf lamina ovate to lanceolate, without lobes 2
1b. Leaf palmatifid, with some degree of lobing 5

2a. Stems and petioles glabrous or subglabrous 3
2b. Stems and petioles with a distinct indumentum 4

3a. Leaf lamina ovate, tepals white ..... *B. venusta*
3b. Leaf lamina lanceolate, tepals with red stripes on the outer surface ..... *B. hatacoa*

4a. Stem and petiole puberulent, leaves glabrous above ..... *B. siamensis*
4b. Stem and petiole hirsute, leaves echinate above ..... *B. cathcartii*

5a. Stem and petioles reddish brown sericeous ..... *B. palmata*
5b. Stem and petioles glabrous or white hirsute or pilose 6

6a. Stem with red striations, leaf lamina deeply palmatifid, bulbils often present, ovary glabrous ..... *B. macrotoma*
6b. Stem uniform green, leaf shallowly palmatifid, bulbils absent, ovary white hirsute .. .. *B. khaophanomensis*

Begonia khaophanomensis Phutthai & M.Hughes, **sp. nov.** § *Platycentrum*
Begonia khaophanomensis is similar to *B. palmata* in habit and leaf shape, but differs in having leaves occurring in opposite pairs at the apex of the plant (not alternate), with white short stiff hairs on the petioles and leaves (not brown sericeous), and a white ovary with white short stiff hairs (not pinkish green and subglabrous). – TYPE: Thailand, Krabi, Khao Phanom District, Khao Phanom Bencha National Park, trail from Ban San to top of Khao Phanom Bencha, on rock along trail in lower montane forest, 8°17′02″N 98°56′17″E, 1200 m, 19 June 2006, *Williams, K., Pooma, R., Poopath, M., Chamchamroon, V. & Seasin, S. 1943* (holotype E; isotypes BKF). (Fig. 1, 2)

Fig. 1. *Begonia khaophanomensis* Phutthai & M.Hughes. **A.** Habit. **B.** Staminate and pistillate flowers. From the type *K. Williams et al. 1943.* (Photos: M. Poopath)

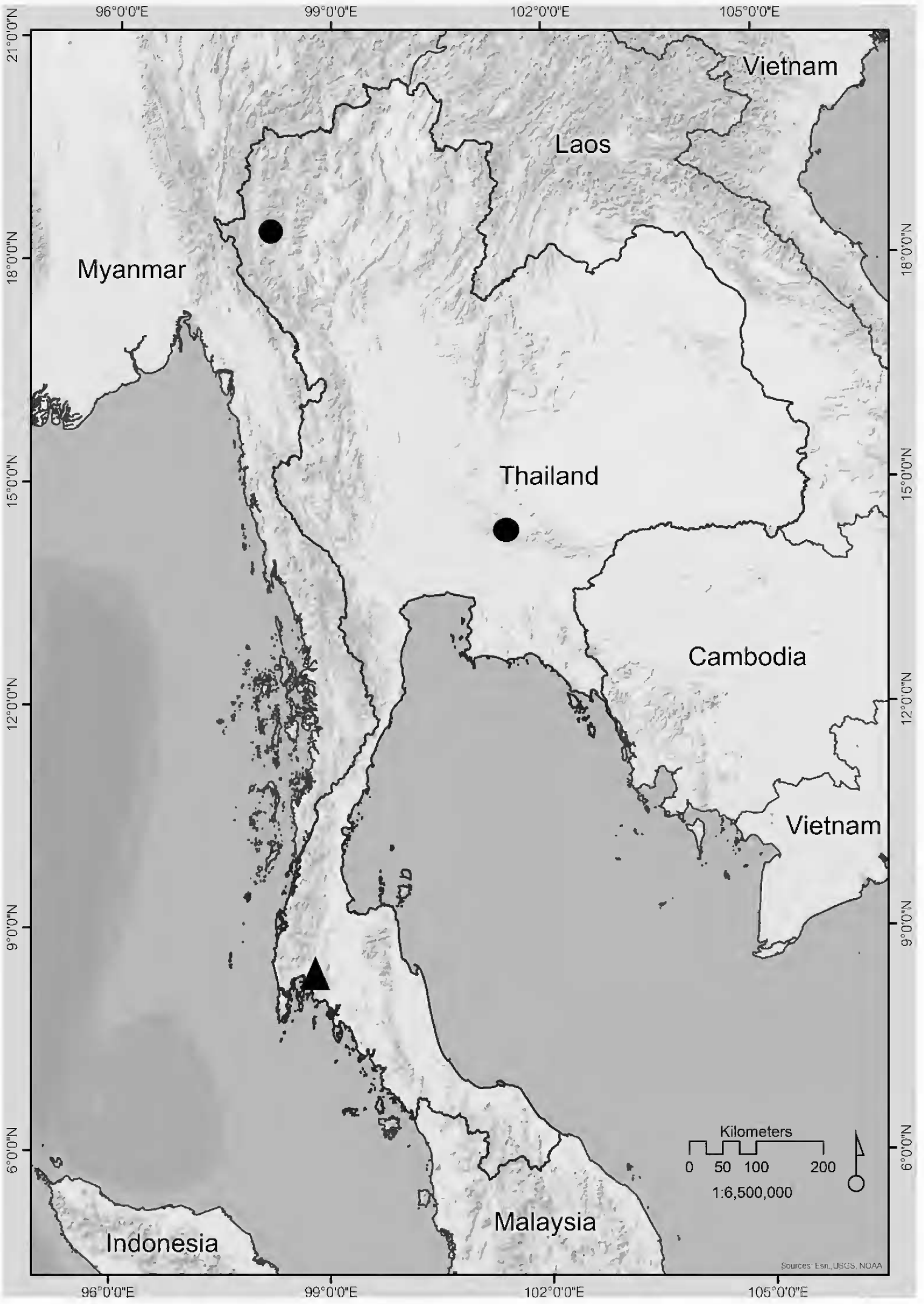

Fig. 2. Distribution of *Begonia khaophanomensis* Phutthai & M.Hughes (triangle) and *B. macrotoma* Irmsch. (dot).

Monoecious herb, c. 60 cm tall. ***Rhizome*** elongated with numerous fibrous roots, glabrous. ***Stems*** erect, terete, pale green. ***Leaves*** 6–8 per plant (occurring as an opposite pair subtending the inflorescence), lamina basifixed; petiole 7–12 cm long, with dense white short stiff hairs (hirsute); leaf blade membranaceous, asymmetric, chartaceous when dry, base deeply cordate, adaxial surface densely minutely hirsute, dull dark green, abaxial surface paler, densely hirsute especially on veins, 8–10 × 5–13 cm, shallowly palmatifid with 6–8 lobes, margin serrate-fimbriate with long stiff hairs, venation palmate, midrib and lateral veins concolourous with lamina, 5–7 veins, slightly impressed above and prominent beneath, apex acuminate. ***Stipules*** prominent, pale green, ovate-lanceolate, densely hairy, 5–15 × 3–5 mm, apex acute, margin entire. ***Inflorescences*** terminal or axillary, bisexual, 8–10 cm long, cymose with c. 3 staminate flowers and 2 pistillate flowers, protandrous; peduncle c. 8 cm long, terete, pale green with dense short stiff hairs. ***Bracts*** caducous, lanceolate, pale green 3–5 × 2–4 mm, apex acute, margin entire. ***Staminate flower*****:** pedicels white, c. 10 mm long; tepals 4, white; outer 2 broadly elliptic, c. 15 × 20 mm, apex rounded, margin entire, base rounded, outer surface with dense short scabrid hairs, inner surface glabrous; inner 2 obovate, c. 12 × 10 mm, apex obtuse, margin entire, base obtuse, outer surface with sparse short scabrid hairs, inner surface glabrous; androecium actinomorphic, globose, stamens numerous, yellow, filaments united at the base, c. 3 mm long, anthers oblong, c. 2 mm long, dehiscing by longitudinal slits, connective extended, rounded. ***Pistillate flowers*****:** pedicels white, c. 10 mm long; tepals 5, white, subequal; densely scabrid adaxially, 18–20 × 20 mm; styles 2, fused at base, crescent-shaped, stigmatic band twice spirally twisted; ovary white, densely minutely scabrid, with 3 unequal wings, 2-locular, placenta bilamellate. ***Fruits*** dehiscent between the two smaller wings, reddish green, drying pale brown, capsule obovate, c. 14 × 8 mm, abaxial wing oblong or obliquely triangular, densely minutely scabrid, c. 40 mm long, 2 lateral wings c. 4 mm long, cucullate. ***Seeds*** numerous, brown, barrel-shaped, 0.4–0.5 mm long.

Distribution. Endemic to Peninsular Thailand (known from only the type locality).

Habitat and ecology. On granitic rock crevices by streams in hill evergreen forest and seasonally dry evergreen forest at c. 1200 m. Flowering and fruiting June to October.

Provisional IUCN category. Least Concern (LC). This species is only known from the type locality in the Khao Phanom Bencha National Park which currently is well protected and likely covers the entire natural range of the species. Hence, although rare, the threat criteria for Critically Endangered or Endangered are not met. *Begonia khaophanomensis* potentially qualifies as Vulnerable under VUD2, although with the lack of a plausible future threat we consider Least Concern to be the most appropriate category as long as Khao Phanom Bencha remains well managed.

Notes. The opposite leaves and stiff hairs indicate an alliance to *Begonia areolata* Miq. from Sumatra and Java which differs in having leaves which are minutely bullate and with red hairs, and in having petals which are elongate-elliptic in the male flowers (not broadly elliptic). The specific epithet refers to the district in which the type material was collected, Khao Phanom.

Begonia macrotoma Irmsch., Notes Roy. Bot. Gard. Edinburgh 21: 41 (1951); Gu et al., Fl. China 13: 185 (2007); Hughes, Annot. Checklist of Southeast Asian *Begonia* 77 (2008). – TYPE: China, Yunnan, 29 June 1938, *Yu, T.T. 17778* (holotype KUN, n.v.; isotype E). (Fig. 2, 3)

Monoecious herb, 60–90 cm tall. ***Rhizome*** elongated with numerous fibrous roots, glabrous, c. 20 mm diam. ***Stems*** erect, terete, pale green with numerous dark red striations. ***Leaves*** 3–6 per plant, lamina basifixed; petiole 10–20(–30) cm long, pilose; leaf blade membranaceous, asymmetric, chartaceous when dry, base slightly cordate, adaxial surface densely scabrid, dull dark green, abaxial surface paler, sparsely scabrid, glossy; 12–30 × 7–28 cm, palmatifid to deeply palmatifid with 3–8 lobes, margin sinuate or denticulate, venation palmate, midrib and lateral veins concolourous with lamina, 5–7 veins, slightly impressed above and prominent beneath, apex acuminate; bulbils and plantlets form at the sinus of the lamina. ***Stipules*** caducous, dark red, ovate, 2–3 × 1.8 cm, apex cuspidate, margin entire. ***Inflorescences*** terminal, bisexual, 20–40 cm long, compound cyme, branching 1–2 times with 3–12 staminate flowers and 2–8 pistillate flowers per branch, protandrous; peduncle 15–25 cm long, terete, pale green with dense brown villous hairs. ***Bracts*** caducous, ovate, dark red, 3–10 × 4–10 mm, apex acute, margin entire. ***Staminate flowers*:** pedicels pale pink, 10–20 mm long; tepals 4, white or pale pink; outer 2 orbicular, 20–25 mm diameter, apex rounded, margin entire, base rounded, outer surface magenta hirsute at the centre, inner surface glabrous; inner 2 obovate, 15–20 × 5–10 mm, apex obtuse, margin entire, base obtuse, glabrous on both sides; androecium actinomorphic, globose, stamens numerous, yellow, filaments united at base, c. 2 mm long, anthers obovate, c. 2.5 mm long, dehiscing by lateral slits, connective extended, rounded. ***Pistillate flowers*:** pedicels pale pink, 10–20 mm long; tepals (?3–)5, white or pale pink, unequal; outer 2 orbicular, outer surface pubescent, 18–20 × 20–25 mm, inner 1–3 obovate, c. 20 × 8–12 mm, outer surface pubescent; styles 2, crescent-shaped, fused at base, stigmatic band twice spirally twisted; ovary pale pink, minutely colliculate, with 3 unequal wings, 2–locular, placenta bilamellate. ***Fruits*** dehiscent dehiscent between the two smaller wings, pale green, drying pale brown, capsule obovate, c. 14 × 8 mm, abaxial wing oblong with a rounded tip, 35–40 mm long, 2 lateral wings c. 5 mm long, curved along the ovary. ***Seeds*** numerous, brown, barrel-shaped. 0.5–0.6 mm long.

Distribution. In Northern Thailand, in Chiangmai province, and in Southeastern Thailand, in Nakhon Ratcahsima and Nakhon Nayok Provinces. Further distribution in China, Myanmar, NE India, Nepal and Vietnam.

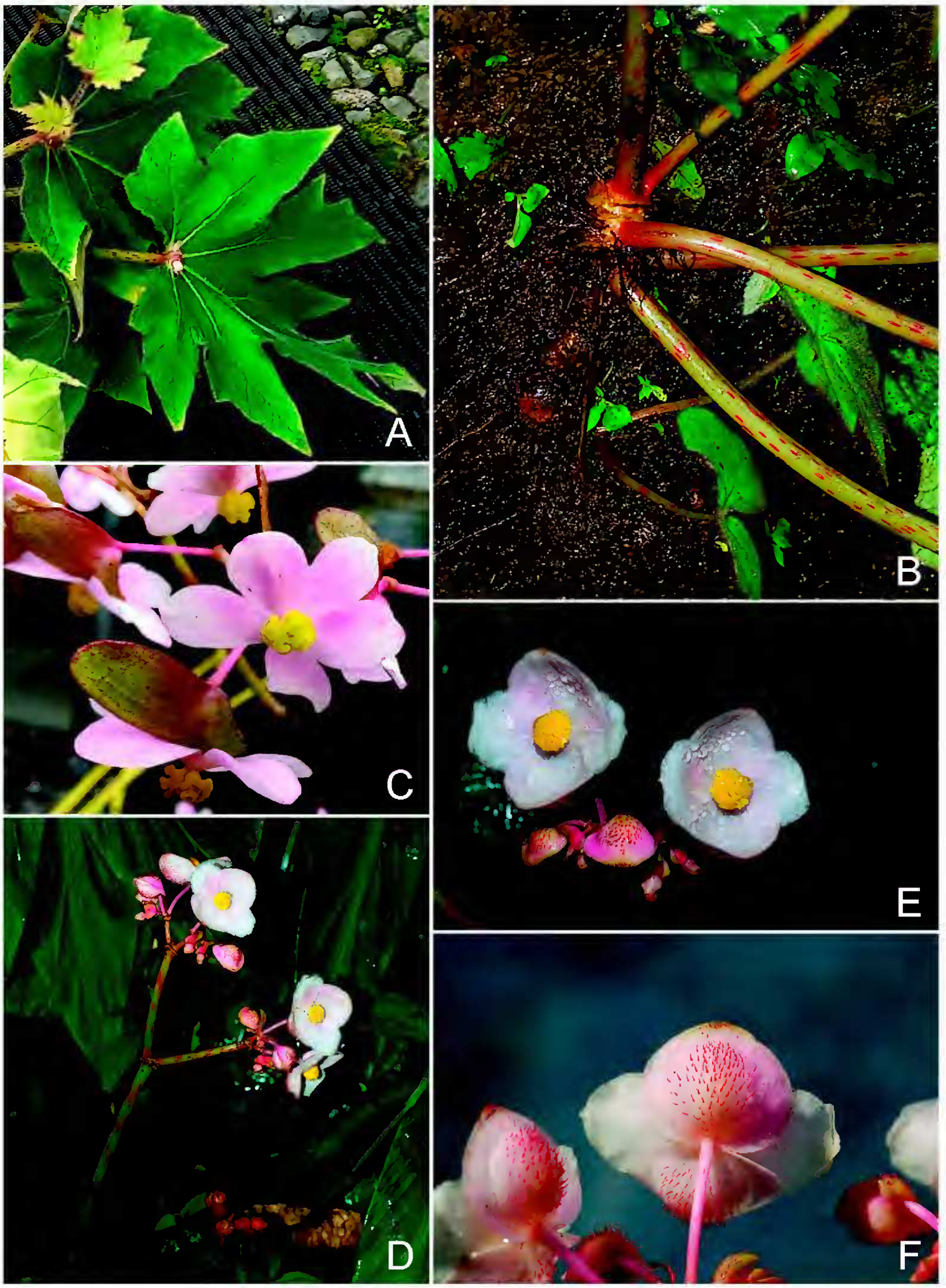

Fig. 3. *Begonia macrotoma* Irmsch. **A.** Leaf shape and bulbils/plantlets at the sinus of the leaf lamina. **B.** Rhizome. **C.** Pistillate flowers. **D.** Inflorescence. **E.** Staminate flowers. **F.** Magenta hirsute hairs on the outer tepals. A & C from *Middleton et al. 4515* in cultivation at the Royal Botanic Garden Edinburgh, accession number 20082075; B, D–F from *Phutthai 145.* (Photos: A & C: M. Hughes; B, D–F: T. Phutthai)

Habitat and ecology. In granitic rock crevices by streams in hill evergreen forest and seasonally dry evergreen forest at around 600 m. Flowering May to November; fruiting November to January.

Provisional IUCN category. Least Concern (LC). The species has a wide distribution in evergreen and seasonal montane forests.

Specimens examined. THAILAND: **Chiang Mai:** Doi Inthanon National Park, 25 Jan 1990, *Hoover, W.S. 727* (K [3 sheets]); Doi Inthanon National Park, Wachirithan Waterfall, 19 Sep 2008, *Middleton, D.J. et al. 4515* (BK, BKF, E); ibidem, 24 Nov 2007, *Phutthai, T. 145* (PSU, BKF); **Nakhon Ratchasima:** Khao Yai National Park, Orchid Waterfall, 22 Oct 1969, *van Beusekom, C. F. & Charoenpol, C. 1834* (AAU [2 sheets], BKF, E [2 sheets], L); ibidem, 31 Oct 1970, *Charoenpol, C. et al. 4349* (AAU, BKF); Khao Yai National Park, Haew Sai Waterfall. 20 Nov 1984, *McAllan A. 9* (K [3 sheets]); **Nakhon Nayok:** Khao Yai National Park, Haew Suwat Waterfall, 21 Dec 2006, *Peng, C-I. & Somprasong, W. 21017* (HAST [2 sheets]).

Notes. Begonia macrotoma is a widespread species. The red striations on the stem and the bulbils which appear at the sinus of the large (up to 30 cm long) palmatifid leaves are distinctive. The species was originally described from a single specimen, which according to the protologue has female flowers with three tepals. However all female material seen by the authors has five tepals; in all other aspects the specimens agree.

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